RESTRICTED CIRCULATION

THIS PAPER IS NOT AN OFFICIAL DOCUMENT; IT IS FOR INFORMATION ONLY AND MUST NOT BE QUOTED IN ANY PRINTED PUBLICATION

Agricultural Memorandum No. 781

Estimation of Areal Values of Excess Winter rain.

H Drinkwater

Data for about 100 stations are regularly used to estimate monthly soil moisture balances. The average potential transpiration for each station was found by adjusting according to station height; average annual rainfalls are known. Average excess winter rain was then calculated using the quick formulae in Ag.Mem. No. 549.

The ratio of station average to areal average of excess winter rain gives a conversion factor which can be used in the estimation of the yearly areal value of excess winter rain from current station values. This estimation uses weighted values from stations in and outside the area, namely, 1 for stations inside the area and $\frac{1}{2}$ for stations from surrounding areas.

The formulae for estimating areal values are given in the appendix.

Any comments or suggestions on this paper should be referred to the author.

Meteorological Office
Bracknell

January 1976

APPENDIX

AREA	FORMULA
1A	$\frac{1}{2}\sqrt{(1.20 \times \text{Seahouses}) + (0.57 \times \text{Boulmer}) + (0.15 \times \text{Kielder Castle})}$
1B	$1/2.5\sqrt{(1.20 \times \text{Boulmer}) + (0.63 \times \text{Seahouses}) + (0.15 \times \text{Kielder Castle}) + (0.56 \times \text{Durham})}$
2	$\frac{1}{4}\sqrt{(0.91 \times \text{Redesdale}) + (0.63 \times \text{Kielder Castle}) + (1.29 \times \text{Seahouses}) + (1.24 \times \text{Boulmer}) + (0.66 \times \text{Carlisle}) + (0.87 \times \text{Haydon Bridge})}$
3	$1/3.5\sqrt{(1.48 \times \text{Carlisle}) + (0.92 \times \text{Sellafield}) + (0.35 \times \text{Kielder Castle}) + (0.20 \times \text{Grizedale}) + (0.45 \times \text{Cartmel})}$
4	$1/3.5\sqrt{(2.10 \times \text{Haydon Bridge}) + (1.34 \times \text{Ilkley}) + (0.65 \times \text{Newton Rigg}) + (1.39 \times \text{Durham}) + (1.71 \times \text{Leeming})}$
5	$1/3.5\sqrt{(1.09 \times \text{Durham}) + (1.34 \times \text{Leeming}) + (0.59 \times \text{Boulmer}) + (0.41 \times \text{Haydon Bridge}) + (0.51 \times \text{Pickering})}$
6	$1/5.5\sqrt{(2.61 \times \text{Newton Rigg}) + (0.77 \times \text{Moor House}) + (1.17 \times \text{Malham Tarn}) + (0.88 \times \text{Grizedale}) + (1.00 \times \text{Sellafield}) + (0.98 \times \text{Cartmel}) + (0.96 \times \text{Nelson})}$
7	$1/3.5\sqrt{(0.88 \times \text{Silphomoor}) + (1.56 \times \text{Pickering}) + (0.83 \times \text{Durham}) + (1.03 \times \text{Leeming}) + (0.57 \times \text{High Mowthorpe})}$
8	$1/5\sqrt{(0.98 \times \text{Cartmel}) + (1.47 \times \text{Kirkham}) + (0.96 \times \text{Nelson}) + (0.50 \times \text{Sellafield}) + (0.86 \times \text{Squires Gate}) + (0.91 \times \text{Ringway}) + (0.33 \times \text{Buxton})}$
9	$\frac{1}{4}\sqrt{(1.08 \times \text{Speke}) + (0.89 \times \text{Squires Gate}) + (0.38 \times \text{Kirkham}) + (0.47 \times \text{Ringway}) + (0.67 \times \text{Hawarden Bridge}) + (0.25 \times \text{Cartmel})}$
10	$\frac{1}{4}\sqrt{(1.28 \times \text{Huddersfield}) + (0.83 \times \text{Buxton}) + (0.54 \times \text{Nelson}) + (1.03 \times \text{Sheffield}) + (1.37 \times \text{Morley}) + (0.75 \times \text{Ilkley})}$
11	$1/4.5\sqrt{(0.77 \times \text{Ilkley}) + (0.88 \times \text{Bradford}) + (1.02 \times \text{Sheffield}) + (0.32 \times \text{Huddersfield}) + (0.27 \times \text{Nelson}) + (0.58 \times \text{Harrogate})}$
12	$1/3.5\sqrt{(1.09 \times \text{Askham Bryan}) + (0.67 \times \text{Harrogate}) + (0.55 \times \text{Leeming}) + (0,31 \times \text{High Mowthorpe}) + (0.76 \times \text{Finningley})}$
13	$1/3.5\sqrt{(0.64 \times \text{High Mowthorpe}) + (1.04 \times \text{Hull}) + (0.43 \times \text{Pickering}) + (0.56 \times \text{Askham Bryan}) + (0.40 \times \text{Binbrook})}$
14	$\frac{1}{4}\sqrt{(1.31 \times \text{Hawarden Bridge}) + (0.92 \times \text{Ringway}) + (0.53 \times \text{Speke}) + (0.53 \times \text{Ruthin}) + (0.73 \times \text{Shawbury}) + (0.57 \times \text{Stone})}$
15A	$\frac{1}{3}\sqrt{(1.32 \times \text{Stone}) + (0.53 \times \text{Ringway}) + (0.65 \times \text{Walsall}) + (0.73 \times \text{Morley}) + (0.79 \times \text{Penkridge})}$

AREA	
15B	$\frac{1}{3}\sqrt{(1.02\times\text{Morley})+(0.47\times\text{Stone}+(0.79\times\text{Sutton Bonington})+(0.57\times\text{Newtown Linford})+(0.45\times\text{Walsall})}$
16	$1/5\sqrt{(1.33\times\text{Finningley})+(1.07\times\text{Sutton Bonington})+(1.06\times\text{Warsop})+(0.47\times\text{Askham Bryan})+(0.59\times\text{Cranwell})+(0.59\times\text{Wittering})+(0.39\times\text{Newtown Linford})}$
17A	$\frac{1}{4}\sqrt{(1.07\times\text{Wittering})+(1.08\times\text{Cranwell})+(0.60\times\text{Finningley})+(0.31\times\text{Binbrook})+(0.61\times\text{Terrington St. Clement})+(0.49\times\text{Sutton Bonington})}$
17B	$1/3.5\sqrt{(0.76\times\text{Binbrook})+(1.31\times\text{Skegness})+(0.50\times\text{Hull})+(0.75\times\text{Terrington St. Clement})+(0.66\times\text{Cranwell})}$
18A	$\frac{1}{4}\sqrt{(1.38\times\text{Shawbury})+(0.75\times\text{Oswestry})+(0.61\times\text{Hawarden Bridge})+(0.53\times\text{Stone})+(0.65\times\text{Hampton Loade})+(0.39\times\text{Stoke St. Milborough})}$
18B	$1/2.5\sqrt{(0.97\times\text{Stoke St. Milborough})+(0.47\times\text{Oswestry})+(0.80\times\text{Hampton Loade})+(0.61\times\text{Malvern})}$
19	$\frac{1}{4}\sqrt{(1.04\times\text{Penkridge})+(1.07\times\text{Hampton Loade})+(0.57\times\text{Shawbury})+(0.44\times\text{Stone})+(0.43\times\text{Walsall})+(0.81\times\text{Pershore})}$
20	$1/3.5\sqrt{(1.04\times\text{Elmdon})+(0.84\times\text{Walsall})+(0.51\times\text{Penkridge})+(0.53\times\text{Newtown Linford})+(0.80\times\text{Pershore})}$
21	$\frac{1}{4}\sqrt{(1.35\times\text{Wellesbourne})+(1.39\times\text{Pershore})+(0.45\times\text{Elmdon})+(0.41\times\text{Brize Norton})+(0.50\times\text{Cheltenham})+(0.37\times\text{Malvern})}$
22A	$\frac{1}{4}\sqrt{(0.94\times\text{Newtown Linford})+(1.27\times\text{Bugbrooke Mills})+(0.69\times\text{Wellesbourne})+(0.65\times\text{Sutton Bonington})+(0.71\times\text{Raunds})+(0.86\times\text{Caldecott})}$
22B	$\frac{1}{4}\sqrt{(1.18\times\text{Raunds})+(1.43\times\text{Caldecott})+(0.53\times\text{Bugbrooke Mills})+(0.59\times\text{Wittering})+(0.86\times\text{Silsoe})+(0.80\times\text{NIAB})}$
23	$1/2.5\sqrt{(1.03\times\text{Terrington St Clement})+(0.45\times\text{Skegness})+(0.41\times\text{Marham})+(0.45\times\text{Wittering})}$
24	$1/5\sqrt{(1.01\times\text{Marham})+(1.10\times\text{Lowestoft})+(0.93\times\text{Cromer})+(0.63\times\text{Terrington St. Clement})+(0.75\times\text{NIAB})+(0.57\times\text{Wattisham})+(0.59\times\text{Honington})}$
25A	$1/3.5\sqrt{(1.30\times\text{Preston Wynne})+(1.02\times\text{Malvern})+(0.37\times\text{Stoke St Milborough})+(0.93\times\text{Pershore})+(0.67\times\text{Cheltenham})}$
25B	$\frac{1}{4}\sqrt{(0.90\times\text{Usk})+(0.82\times\text{Crumbland Plantation})+(1.04\times\text{Cheltenham})+(1.15\times\text{Rhoose})+(0.59\times\text{Long Ashton})}$
26	$\frac{1}{4}\sqrt{(0.91\times\text{Little Rissington})+(1.03\times\text{Brize Norton})+(0.64\times\text{Cheltenham})+(0.89\times\text{Pershore})+(0.51\times\text{Lyneham})+(0.86\times\text{Wellesbourne})}$
27	$\frac{1}{4}\sqrt{(1.19\times\text{Aylesbury})+(0.92\times\text{Hurley})+(0.41\times\text{Brize Norton})+(1.03\times\text{Silsoe})+(0.45\times\text{Rothamsted})+(0.68\times\text{Benson})}$
28	$1/5\sqrt{(0.98\times\text{Wittering})+(1.23\times\text{NIAB})+(1.31\times\text{Silsoe})+(0.45\times\text{Raunds})+(0.51\times\text{Terrington St Clement})+(0.49\times\text{Honington})+(0.29\times\text{Rothamsted})}$

AREA	
29	1/5√(0.85xStansted)+(1.04xHonington)+(1.00xWattisham)+(0.48xLowestoft)+(0.60xClacton)+(0.66xNIAB)+(0.44xMarham)7
30	1/5√(0.79xLong Ashton)+(1.17xLyneham)+(1.45XCheltenham)+(0.31xUsk)+(1.01xPershore)+(0.44xMarlborough)+(0.59xCannington)7
31A	1/3√(1.39xBenson)+(0.43xLyneham)+(0.43xBrize Norton)+(0.61xAylesbury)+(0.33xLong Sutton)7
31B	¼√(1.00xLeckford)+(1.01xLong Sutton)+(1.05xBenson)+(0.89xShinfield)+(0.55xSouthampton)+(0.62xBoscombe Down)7
32	¼√(1.33xWisley)+(1.36xShinfield)+(0.79xBenson)+(0.54xHurley)+(0.45xEdenbridge)+(0.46xNorth Heath)7
33A	1/3√(0.85xRothamsted)+(0.57xAylesbury)+(0.99xSilsoe)+(0.59xStansted)+(0.85xWrittle)7
33B	1/3.5√(1.09xWrittle)+(1.08xClacton)+(0.27xRothamsted)+(0.45xWattisham)+(0.44xGillingham)7
34	1/3.5√(1.23xGillingham)+(0.89xFaversham)+(0.76xWrittle)+(0.65xManston)+(0.45xEast Malling)7
35	¼√(1.45xCannington)+(0.75xCheldon Barton)+(0.49xLong Ashton)+(0.66xExetor)+(0.37xIlframcombe)+(0.73xLyneham)7
36	¼√(1.24xBoscombe Down)+(0.95xMarlborough)+(0.64xLyneham)+(0.50xLeckford)+(0.42xShaftesbury)+(0.33xCheldon Barton)7
37A	1/3√(1.07xNorth Heath)+(0.78xWisley)+(0.52xEdenbridge)+(0.45xLong Sutton)+(0.31xPlumpton)7
37B	1/2.5√(1.43xWorthing)+(0.66xLittlehampton)+(0.60xNorth Heath)+(0.55xEastbourne)7
38A	1/4.5√(0.97xBodiam)+(1.12xEdenbridge)+(1.08xEast Hoathly)+(0.57xNorth Heath)+(0.77xEast Malling)+(0.33xPlumpton)7
38B	1/3.5√(1.15xEastbourne)+(0.73xPlumpton)+(0.75xWorthing)+(0.53xBodiam)+(0.89xFolkestone)7
39A	¼√(1.07xEast Malling)+(0.83xWye)+(0.39xEdenbridge)+(0.53xFaversham)+(0.74xGillingham)+(0.34xBodiam)7
39B	1/3.5√(1.48xManston)+(1.07xFolkestone)+(0.51xFaversham)+(0.39xWye)+(0.33xBodiam)7
40	1/3√(1.03xCamborne) +(0.94xFalmouth)+(0.43xEllbridge)+(0.22xBastreet)7
41	1/2.5√(1.65xHartland Point)+(0.51xEllbridge)+(0.61xIlfracombe)+(0.26xBastreet)7

AREA	
42	$\frac{1}{4}\sqrt{}$(1.17xEllbridge)+(0.60xBastreet)+(0.71xCamborne)+(0.95xHartlandpoint)+(0.73xNewton Abbot)+(0.69xSlapton)$\sqrt{}$7
43A	1/3.5$\sqrt{}$(1.92xNewton Abbot)+(0.56xPrincetown)+(0.39xBastreet)+(0.45xHawkridge)+(0.93xCheldon Barton)$\sqrt{}$7
43B	1/3.5$\sqrt{}$(1.05xSlapton)+(1.71xStarcross)+(0.56xNewton Abbot)+(0.45xEllbridge)+(0.96xExeter)$\sqrt{}$7
44	1/3.5$\sqrt{}$(1.47xIlfracombe)+(0.72xHawkridge)+(1.00xHartlandPoint)+(0.75xCheldon Barton)+(0.23xPrincetown)$\sqrt{}$7
45A	1/2.5$\sqrt{}$(1.45xExeter)+(0.65xStarcross)+(0.41xCheldon Barton)+(0.55xWinfrith)$\sqrt{}$7
45B	$\frac{1}{4}\sqrt{}$(1.06xWinfrith)+(1.02xShaftesbury)+(0.71xExeter)+(0.40xCheldon Barton)+(0.76xBoscombe Down)+(0.67xEverton)$\sqrt{}$7
46	1/4.5$\sqrt{}$(1.10xEverton)+(1.09xSouthampton)+(1.30xLittlehampton)+(0.43xWinfrith)+(0.99xLeckford)+(0.71xWorthing)$\sqrt{}$7
47	1/3$\sqrt{}$(1.29xValley)+(0.85xBotwnnog(+(0.15xCeinws)+(0.81xSpeke)$\sqrt{}$7
48A	1/4.5$\sqrt{}$(1.77xBala)+(0.89xTrawsfynydd)+(0.86xCeinws)+(1.19xBotwnnog)+(1.23xCorwen)+(0.37xMoel Cynnedd)$\sqrt{}$7
48B	1/3.5$\sqrt{}$(0.91xCwmystwyth)+(0.64xMoel Cynnedd)+(0.37xTrawsfynydd)+(0.97xBrecon)+(0.91xTrawscoed)$\sqrt{}$7
49A	1/3.5$\sqrt{}$(2.38xRuthin)+(1.28xCorwen)+(0.46xBala)+(0.89xOswestry)+(0.65xLlandrindod Wells)$\sqrt{}$7
49B	1/5$\sqrt{}$(1.26xBrecon)+(1.36xLlandrindod Wells)+(1.00xCenarth Mill)+(0.67xCorwen)+(0.97xStoke St. Milobrough)+(0.31xLlwynon)+0.67xCrumbland Plantation)$\sqrt{}$7
50	1/4.5$\sqrt{}$(1.58xMilford Haven)+(1.01xCarmarthen)+(1.16xTrawscoed)+(0.29xCwmystwyth)+(0.33xBrynammen)+(0.85 ~~1.88~~xRhoose)$\sqrt{}$7
51	1/3.5$\sqrt{}$(1.05xLlwynon)+(1.16xBrynammen)+(1.07xBrecon)+(0.85xCenarth Mill)+(1.14xCrumbland Plantation)$\sqrt{}$7
52	1/2.5$\sqrt{}$(1.46 ~~1.23~~xRhoose)+(0.67xMilford Haven)+(0.63xUsk)+(1.21xCannington)$\sqrt{}$7
Isle of Wight	1/2.5$\sqrt{}$(0.79xShanklin)+(0.53xEverton)+(0.63xLittlehampton)+(0.53xSouthampton)$\sqrt{}$7

RESTRICTED CIRCULATION

THIS PAPER IS NOT AN OFFICIAL DOCUMENT; IT IS FOR INFORMATION ONLY AND MUST NOT BE QUOTED IN ANY PRINTED PUBLICATION

Ag Mem 781a and 783a, 797a

Correction to Ag Mem 781, 783 and 797

Formulae have been calculated using Average Annual Rainfall for Rhoose of 647 instead of 947 mm.

Corrected Formulae:

Ag Mem 781
Area 50 ✓ 0.85 x Rhoose not 1.88 x Rhoose

Area 52 ✓ 1.46 x Rhoose not 3.23 x Rhoose

Ag Mem 783
Area 52 ✓ (Rhoose -1.9) not (Rhoose -6.0)

Ag Mem 797
Area 52 ✓ Areal Return to Capacity Date 1975-76

Oct 21 31 days late

Any comments or suggestions on this paper should be referred to the author.

Meteorological Office
Bracknell

April 1976